$\frac{\lvert\bar{x}-m\rvert}{s(x)}$ $\frac{\lvert\bar{x}_1-\bar{x}_2\rvert}{s(x)}$	β = .01 .05 .1 .2	.01 .05 .1 .2	.01 .05 .1 .2	.01 .05 .1 .2
	Single-sided test α = .005 Double-sided test α = .01	Single-sided test α = .01 Double-sided test α = .02	Single-sided test α = .025 Double-sided test α = .05	Single-sided test α=.05 Double-sided test α=.10
$\frac{(\bar{x}-m)}{s(x)}$ $\frac{(\bar{x}_1-\bar{x}_2)}{s(x)}$	0.01	0.02	0.05	0.10
	Level of t-test			

n_2 / n_1	*.05 *.01	1	.05 .01	2	.05 .01	3	.05 .01	4	.05 .01	5	.05 .01	6	.05 .01	8	.05 .01	12	.05 .01	24	.05 .01	∞
1		161 4052		200 4999		216 5403		225 5625		230 5764		234 5859		239 5981		244 6106		249 6234		254 6366
2		18.51 98.49		19.00 99.00		19.16 99.17		19.25 99.25		19.30 99.30		19.33 99.33		19.37 99.36		19.41 99.42		19.45 99.46		19.50 99.50
3		10.13 34.12		9.55 30.82		9.28 29.46		9.12 28.71		9.01 28.24		8.94 27.91		8.84 27.49		8.74 27.05		8.64 26.60		8.53 26.12
4		7.71 21.20		6.94 18.00		6.59 16.69		6.39 15.98		6.26 15.52		6.16 15.21		6.04 14.80		5.91 14.37		5.77 13.93		5.63 13.46
5		6.61 16.26		5.79 13.27		5.41 12.06		5.19 11.39		5.05 10.97		4.95 10.67		4.82 10.27		4.68 9.89		4.53 9.47		4.36 9.02
6		5.99 13.74		5.14 10.92		4.76 9.78		4.53 9.15		4.39 8.75		4.28 8.47		4.15 8.10		4.00 7.72		3.84 7.31		3.67 6.88
7		5.59 12.25		4.74 9.55		4.35 8.45		4.12 7.85		3.97 7.46		3.87 7.19		3.73 6.84		3.57 6.47		3.41 6.07		3.23 5.65
8		5.32 11.26		4.46 8.65		4.07 7.59		3.84 7.01		3.69 6.63		3.58 6.37		3.44 6.03		3.28 5.67		3.12 5.28		2.93 4.86
9		5.12 10.56		4.26 8.02		3.86 6.99		3.63 6.42		3.48 6.06		3.37 5.80		3.23 5.47		3.07 5.11		2.90 4.73		2.71 4.31
10		4.96 10.04		4.10 7.56		3.71 6.55		3.48 5.99		3.33 5.64		3.22 5.39		3.07 5.06		2.91 4.71		2.74 4.33		2.54 3.91
11		4.84 9.65		3.98 7.20		3.59 6.22		3.36 5.67		3.20 5.32		3.09 5.07		2.95 4.74		2.79 4.40		2.61 4.02		2.40 3.60
12		4.75 9.33		3.88 6.93		3.49 5.95		3.26 5.41		3.11 5.06		3.00 4.82		2.85 4.50		2.69 4.16		2.50 3.78		2.30 3.36
13		4.67 9.07		3.80 6.70		3.41 5.74		3.18 5.20		3.02 4.86		2.92 4.62		2.77 4.30		2.60 3.96		2.42 3.59		2.21 3.16
14		4.60 8.86		3.74 6.51		3.34 5.56		3.11 5.03		2.96 4.69		2.85 4.46		2.70 4.14		2.53 3.80		2.35 3.43		2.13 3.00
15		4.54 8.68		3.68 6.36		3.29 5.42		3.06 4.89		2.90 4.56		2.79 4.32		2.64 4.00		2.48 3.67		2.29 3.29		2.07 2.87
16		4.49 8.53		3.63 6.23		3.24 5.29		3.01 4.77		2.85 4.44		2.74 4.20		2.59 3.89		2.42 3.55		2.24 3.18		2.01 2.75
17		4.45 8.40		3.59 6.11		3.20 5.18		2.96 4.67		2.81 4.34		2.70 4.10		2.55 3.79		2.38 3.45		2.19 3.08		1.96 2.65
18		4.41 8.28		3.55 6.01		3.16 5.09		2.93 4.58		2.77 4.25		2.66 4.01		2.51 3.71		2.34 3.37		2.15 3.00		1.92 2.57
19		4.38 8.18		3.52 5.93		3.13 5.01		2.90 4.50		2.74 4.17		2.63 3.94		2.48 3.63		2.31 3.30		2.11 2.92		1.88 2.49
20		4.35 8.10		3.49 5.85		3.10 4.94		2.87 4.43		2.71 4.10		2.60 3.87		2.45 3.56		2.28 3.23		2.08 2.86		1.84 2.42
22		4.30 7.94		3.44 5.72		3.05 4.82		2.82 4.31		2.66 3.99		2.55 3.76		2.40 3.45		2.23 3.12		2.03 2.75		1.78 2.31
24		4.26 7.82		3.40 5.61		3.01 4.72		2.78 4.22		2.62 3.90		2.51 3.67		2.36 3.36		2.18 3.03		1.98 2.66		1.73 2.21
26		4.22 7.72		3.37 5.53		2.98 4.64		2.74 4.14		2.59 3.82		2.47 3.59		2.32 3.29		2.15 2.96		1.95 2.58		1.69 2.13
28		4.20 7.64		3.34 5.45		2.95 4.57		2.71 4.07		2.56 3.76		2.44 3.53		2.29 3.23		2.12 2.90		1.91 2.52		1.65 2.06
30		4.17 7.56		3.32 5.39		2.92 4.51		2.69 4.02		2.53 3.70		2.42 3.47		2.27 3.17		2.09 2.84		1.89 2.47		1.62 2.01
40		4.08 7.31		3.23 5.18		2.84 4.31		2.61 3.83		2.45 3.51		2.34 3.29		2.18 2.99		2.00 2.66		1.79 2.29		1.51 1.81
50		4.03 7.17		3.18 5.06		2.79 4.20		2.56 3.72		2.40 3.41		2.29 3.18		2.13 2.88		1.95 2.56		1.74 2.18		1.44 1.68
60		4.00 7.08		3.15 4.98		2.76 4.13		2.52 3.65		2.37 3.34		2.25 3.12		2.10 2.82		1.92 2.50		1.70 2.12		1.39 1.60
120		3.92 6.85		3.07 4.79		2.68 3.95		2.45 3.48		2.29 3.17		2.17 2.96		2.02 2.66		1.83 2.34		1.61 1.95		1.25 1.38
∞		3.84 6.64		2.99 4.60		2.60 3.78		2.37 3.32		2.21 3.02		2.09 2.80		1.94 2.51		1.75 2.18		1.52 1.79		1.00 1.00

n_1 = the number of degrees of freedom of the numerator

n_2 = the number of degrees of freedom of the denominator

* Significance levels

A'

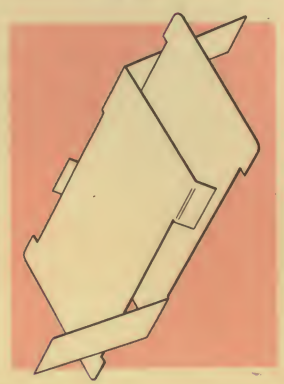
VARIANCE RATIO

Reproduced from Table 10.5.3 in George W. Snedecor, "Statistical Methods," 5th ed., Iowa State College Press, Ames, Iowa, 1956, by permission of publisher.

Patent 2222661

INSTRUCTIONS FOR ASSEMBLING

1. Remove this insert page from magazine.
2. Using scissors, carefully cut out the two parts along outline. For added protection brush or spray a coat of shellac or plastic on all surfaces.
3. Fold the straps along the dotted lines.
4. Place the two parts together as shown in the diagram. With glue or double-coated tape attach A to A' and B to B'.



FOLD TAB UP AND OVER

FOLD STRAP UP AND OVER

CUT ON THIS OUTLINE

I/EC STATISTICAL DATA CHARTS

Reproduced from Albert H. Bowker and Gerald J. Lieberman, "Engineering Statistics," pp 382, 2nd edition, Prentice-Hall, Inc., with permission of the publisher.

Statistic	Analysis of past data: Central line	Analysis of past data: Limits	Standards given: Central line	Standards given: Limits
Standard deviation	$\hat{\sigma}$	$B_{3'}\bar{\sigma}$, $B_{4'}\bar{\sigma}$	$c_{2'}$	$B_{1'}$, $B_{2'}$
Range	$\overline{Rl}$	$D_3\overline{R}$, $D_4\overline{R}$	$d_{2'}$	$D_{1'}$, $D_{2'}$
Average, using σ'	$\bar{\bar{x}}$	$\bar{\bar{x}} \pm A_1\bar{\sigma}$	$\bar{x}'$	$\bar{x}' \pm A_{2'}$
Average, using $\bar{R}$	$\bar{\bar{x}}$	$\bar{\bar{x}} \pm A_2\bar{R}$	—	$\bar{x}' \pm A_{3'}$

Reproduced from "Quality Control of Materials," Special Technical Publication 15-C, pp 115, Table 82, American Society for Testing Materials, Philadelphia, 1951, with permission of publisher.

FACTORS FOR COMPUTING CONTROL CHART LINES

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	B_6	c_2	d_2	$1/d_2$	d_3	D_1	D_2	D_3	D_4
2	2.121	1.880	2.659	0	1.843	0	3.267	0	1.128	0.5642	1.128	0.8865	0.853	0	3.686	0	3.267
3	1.732	1.023	1.954	0	1.858	0	2.568	0	1.693	0.7236	1.693	0.5907	0.888	0	4.358	0	2.575
4	1.500	0.729	1.628	0	1.808	0	2.266	0	2.059	0.7979	2.059	0.4857	0.880	0	4.698	0	2.282
5	1.342	0.577	1.427	0	1.756	0	2.089	0	2.326	0.8407	2.326	0.4299	0.864	0	4.918	0	2.115
6	1.225	0.483	1.287	0.026	1.711	0.30	1.970	0	2.534	0.8686	2.534	0.3946	0.848	0	5.078	0	2.004
7	1.134	0.419	1.182	0.105	1.672	0.118	1.882	0.204	2.704	0.8882	2.704	0.3698	0.833	0.076	5.203	0.076	1.924
8	1.061	0.373	1.099	0.167	1.638	0.185	1.815	0.387	2.847	0.9027	2.847	0.3512	0.820	0.136	5.307	0.184	1.864
9	1.000	0.337	1.032	0.219	1.609	0.239	1.761	0.546	2.970	0.9139	2.970	0.3367	0.808	0.184	5.394	0.223	1.816
10	0.949	0.308	0.975	0.262	1.584	0.284	1.716	0.687	3.078	0.9227	3.078	0.3249	0.797	0.223	5.469	0.256	1.777
11	0.905	0.285	0.927	0.299	1.561	0.321	1.679	0.812	3.173	0.9300	3.173	0.3152	0.787	0.256	5.534	0.284	1.744
12	0.866	0.266	0.886	0.331	1.541	0.354	1.646	0.924	3.258	0.9359	3.258	0.3069	0.778	0.284	5.592	0.308	1.716
13	0.832	0.249	0.850	0.359	1.523	0.382	1.618	1.026	3.336	0.9410	3.336	0.2998	0.770	0.308	5.646	0.329	1.692
14	0.802	0.235	0.817	0.384	1.507	0.406	1.594	1.121	3.407	0.9453	3.407	0.2935	0.763	0.329	5.693	0.348	1.671
15	0.775	0.223	0.789	0.406	1.492	0.428	1.572	1.207	3.472	0.9490	3.472	0.2880	0.756	0.348	5.737	0.364	1.652
16	0.750	0.212	0.763	0.427	1.478	0.448	1.552	1.285	3.532	0.9523	3.532	0.2831	0.750	0.364	5.779	0.379	1.636
17	0.728	0.203	0.739	0.445	1.465	0.466	1.534	1.359	3.588	0.9551	3.588	0.2787	0.744	0.379	5.817	0.392	1.621
18	0.707	0.194	0.718	0.461	1.454	0.482	1.518	1.426	3.640	0.9576	3.640	0.2747	0.739	0.392	5.854	0.404	1.608
19	0.688	0.187	0.698	0.477	1.443	0.497	1.503	1.490	3.689	0.9599	3.689	0.2711	0.734	0.404	5.888	0.414	1.596
20	0.671	0.180	0.680	0.491	1.433	0.510	1.490	1.548	3.735	0.9619	3.735	0.2677	0.729	0.414	5.922	0.425	1.586
21	0.655	0.173	0.663	0.504	1.424	0.523	1.477	1.606	3.778	0.9638	3.778	0.2647	0.724	0.425	5.950	0.434	1.575
22	0.640	0.167	0.647	0.516	1.415	0.534	1.466	1.659	3.819	0.9655	3.819	0.2618	0.720	0.434	5.979	0.443	1.566
23	0.626	0.162	0.633	0.527	1.407	0.545	1.455	1.710	3.858	0.9670	3.858	0.2592	0.716	0.443	6.006	0.452	1.557
24	0.612	0.157	0.619	0.538	1.399	0.555	1.445	1.759	3.895	0.9684	3.895	0.2567	0.712	0.452	6.031	0.459	1.548
25	0.600	0.153	0.606	0.548	1.392	0.565	1.435	1.804	3.931	0.9696	3.931	0.2544	0.708	0.459	6.058	0.459	1.541

Designed by Dyna-Slide Co., Chicago 5, Ill.

B'

Degrees of Freedom	.20	.10	.05	.01	.20	.10	.05	.01	.10	.05	.02	.01
	Significance levels — Table of *t*				Significance levels — Table of χ^2				Significance levels — Table of Correlation Coefficient *r*			

Number of observations in sample, n	A	A_1	A_2	c_2	B_1	B_2	B_3	B_4	d_2	D_1	D_2	D_3	D_4
	Factors for control limits			Factor for central line	Factors for control limits				Factor for central line	Factors for control limits			
	Chart for averages			Chart for standard deviations					Chart for ranges				

B

SIGNIFICANCE TABLES

1	3.08	6.31	12.71	63.66	1.64	2.71	3.84	6.64	0.988	0.997	1.00	1.00
2	1.89	2.92	4.30	9.92	3.22	4.61	5.99	9.21	0.900	0.950	0.980	0.990
3	1.64	2.35	3.18	5.84	4.64	6.25	7.82	11.34	0.805	0.878	0.934	0.959
4	1.53	2.13	2.78	4.60	5.99	7.78	9.49	13.28	0.729	0.811	0.882	0.917
5	1.48	2.02	2.57	4.03	7.29	9.24	11.07	15.09	0.669	0.754	0.833	0.874
6	1.44	1.94	2.45	3.71	8.56	10.64	12.59	16.81	0.622	0.707	0.789	0.834
7	1.42	1.90	2.36	3.50	9.80	12.02	14.07	18.48	0.582	0.666	0.750	0.798
8	1.40	1.86	2.31	3.36	11.03	13.36	15.51	20.09	0.549	0.632	0.716	0.765
9	1.38	1.83	2.26	3.25	12.24	14.68	16.92	21.67	0.521	0.602	0.685	0.735
10	1.37	1.81	2.23	3.17	13.44	15.99	18.31	23.21	0.497	0.576	0.658	0.708
11	1.36	1.80	2.20	3.11	14.63	17.28	19.68	24.72	0.476	0.553	0.634	0.684
12	1.36	1.78	2.18	3.06	15.81	18.55	21.03	26.22	0.458	0.532	0.612	0.661
13	1.35	1.77	2.16	3.01	16.98	19.81	22.36	27.69	0.441	0.514	0.592	0.641
14	1.34	1.76	2.14	2.98	18.15	21.06	23.68	29.14	0.426	0.497	0.574	0.623
15	1.34	1.75	2.13	2.95	19.31	22.31	25.00	30.58	0.412	0.482	0.558	0.606
16	1.34	1.75	2.12	2.92	20.46	23.54	26.30	32.00	0.400	0.468	0.542	0.590
17	1.33	1.74	2.11	2.90	21.62	24.77	27.59	33.41	0.389	0.456	0.528	0.575
18	1.33	1.73	2.10	2.88	22.76	25.99	28.87	34.81	0.378	0.444	0.516	0.561
19	1.33	1.73	2.09	2.86	23.90	27.20	30.14	36.19	0.369	0.433	0.503	0.549
20	1.32	1.72	2.09	2.84	25.04	28.41	31.41	37.57	0.360	0.423	0.492	0.537
21	1.32	1.72	2.08	2.83	26.17	29.62	32.67	38.93				
22	1.32	1.72	2.07	2.82	27.30	30.81	33.92	40.29				
23	1.32	1.71	2.07	2.81	28.43	32.01	35.17	41.64				
24	1.32	1.71	2.06	2.80	29.55	33.20	36.42	42.98				
25	1.32	1.71	2.06	2.79	30.68	34.38	37.65	44.31	0.323	0.381	0.445	0.487
26	1.32	1.71	2.06	2.78	31.80	35.56	38.88	45.64				
27	1.31	1.70	2.05	2.77	32.91	36.74	40.11	46.96				
28	1.31	1.70	2.05	2.76	34.03	37.92	41.34	48.28				
29	1.31	1.70	2.04	2.76	35.14	39.09	42.56	49.59				
30	1.31	1.70	2.04	2.75	36.25	40.26	43.77	50.89	0.296	0.349	0.409	0.449
35	1.31	1.69	2.03	2.72					0.275	0.325	0.381	0.418
40	1.30	1.68	2.02	2.70					0.257	0.304	0.358	0.393
45	1.30	1.68	2.02	2.69					0.243	0.288	0.338	0.372
50	1.30	1.68	2.01	2.68					0.231	0.273	0.322	0.354
60	1.30	1.67	2.00	2.66					0.211	0.250	0.295	0.325
70	1.30	1.67	2.00	2.65					0.195	0.232	0.274	0.302
80	1.30	1.67	1.99	2.64					0.183	0.217	0.256	0.283
90	1.29	1.66	1.99	2.63					0.173	0.205	0.242	0.267
100	1.29	1.66	1.98	2.63					0.164	0.195	0.230	0.254
120	1.29	1.66	1.98	2.62								
∞	1.28	1.64	1.96	2.58								

For larger degrees-of-freedom values, the expression $\sqrt{2\chi^2} - \sqrt{2n-1}$ may be used as a normal deviate with unit variance, remembering that the probability for χ^2 corresponds with that of a single tail of the normal curve.

Source: R. A. Fisher and Frank Yates, "Statistical Tables for Biological, Agricultural and Medical Research", Oliver & Boyd, Ltd, Edinburgh, 1953.

A convenient selector of statistical tables used in the chemical industry

FOLD TAB UP AND OVER

FOLD STRAP UP AND OVER

A

NUMBER OF OBSERVATIONS NEEDED IN A *t*-TEST

Ratio of detectable difference to standard deviation, or $D = \frac{\delta}{\sigma}$ where D is the difference it is important to detect, expressed as a multiple of the standard deviation

D																
.30				134				115			119	90		122	97	71
.40		115	97	77		101	85	66	117	84	68	51 / 100	101	70	55 / 108	40 / 78
.50	100	75	63	51 / 96	90	66	55 / 106	43 / 82	76	54 / 106	44 / 86	34 / 64	65	45 / 86	36 / 70	27 / 51
.60	71	53 / 101	45 / 85	36 / 67	63	47 / 90	39 / 74	31 / 58	53 / 104	38 / 74	32 / 60	24 / 45	46 / 69	32 / 61	26 / 49	19 / 36
.70	53 / 100	40 / 75	34 / 63	28 / 50	47 / 90	35 / 66	30 / 55	24 / 43	40 / 76	29 / 55	24 / 44	19 / 34	34 / 66	24 / 45	19 / 36	15 / 26
.80	41 / 77	32 / 58	27 / 49	22 / 39	37 / 70	28 / 51	24 / 43	19 / 33	31 / 59	22 / 42	19 / 34	15 / 26	27 / 50	19 / 35	15 / 28	12 / 21
.90	34 / 62	26 / 46	22 / 39	18 / 31	29 / 55	23 / 41	19 / 34	16 / 27	25 / 47	19 / 34	16 / 27	12 / 21	21 / 40	15 / 28	13 / 22	10 / 16
1.0	28 / 50	22 / 38	19 / 32	16 / 26	25 / 45	19 / 33	16 / 28	13 / 22	21 / 36	16 / 27	13 / 23	10 / 17	18 / 33	13 / 23	11 / 16	8 / 14
1.1	26 / 42	19 / 32	16 / 27	14 / 22	21 / 38	16 / 26	14 / 23	12 / 19	18 / 32	13 / 23	11 / 19	9 / 14	15 / 27	11 / 19	9 / 15	7 / 12
1.2	21 / 36	16 / 27	14 / 23	12 / 18	18 / 32	14 / 24	12 / 20	10 / 16	15 / 27	12 / 20	10 / 16	8 / 12	13 / 23	10 / 16	8 / 13	6 / 10
1.3	18 / 31	15 / 23	13 / 20	11 / 16	16 / 28	13 / 21	11 / 17	9 / 14	14 / 23	10 / 17	9 / 14	7 / 11	11 / 20	8 / 14	7 / 11	6 / 9
1.4	16 / 27	13 / 20	12 / 17	10 / 14	14 / 24	11 / 16	10 / 15	9 / 12	12 / 20	9 / 15	8 / 12	7 / 10	10 / 17	8 / 12	7 / 10	5 / 8
1.5	15 / 24	12 / 18	11 / 15	9 / 13	13 / 21	10 / 16	9 / 14	8 / 11	11 / 16	8 / 13	7 / 11	6 / 9	9 / 15	7 / 11	6 / 9	7
1.6	13 / 21	11 / 16	10 / 14	8 / 11	12 / 19	10 / 14	9 / 12	7 / 10	10 / 16	8 / 12	7 / 10	6 / 8	8 / 14	6 / 10	6 / 8	6
1.7	12 / 19	10 / 15	9 / 13	8 / 10	11 / 17	9 / 13	8 / 11	7 / 9	9 / 14	7 / 11	6 / 9	5 / 7	8 / 12	6 / 9	5 / 7	6
1.8	12 / 17	10 / 13	9 / 11	8 / 10	10 / 15	8 / 12	7 / 10	7 / 8	8 / 13	7 / 10	6 / 8	6	7 / 11	6 / 8	7	5
1.9	11 / 16	9 / 12	8 / 11	7 / 9	10 / 14	8 / 11	7 / 9	6 / 8	8 / 12	6 / 9	6 / 7	6	7 / 10	5 / 7	6	5
2.0	10 / 14	8 / 11	8 / 10	7 / 8	9 / 13	7 / 10	7 / 9	6 / 7	7 / 11	6 / 8	5 / 7	6	6 / 9	7	6	4
2.1	10 / 13	8 / 10	7 / 9	7 / 8	8 / 12	7 / 9	6 / 8	6 / 7	7 / 10	6 / 8	6	5	6 / 8	6	5	4
2.2	9 / 12	8 / 10	7 / 8	6 / 7	8 / 11	7 / 9	6 / 7	5 / 6	7 / 9	6 / 7	6	5	6 / 8	6	5	4
2.3	9 / 11	7 / 9	7 / 8	6 / 7	8 / 10	6 / 8	6 / 7	6	6 / 9	5 / 7	6	5	5 / 7	5	5	4
2.4	8 / 11	7 / 9	7 / 8	6 / 6	7 / 10	6 / 8	6 / 7	6	6 / 8	6	5	4	7	5	4	4
2.5	8 / 10	7 / 8	6 / 7	6 / 6	7 / 9	6 / 7	6 / 6	5	6 / 8	6	5	4	6	5	4	3
3.0	7 / 8	6 / 6	6 / 6	5 / 5	6 / 7	5 / 6	5 / 5	4	5 / 6	5	4	4	5	4	3	
3.5	6 / 6	5 / 5	5 / 5	4	5 / 6	5	4	4	5	4	4	3	4	3		
4.0	6 / 6	5	4	4	5	4	4	3	4	4	3		4			

(In each cell the first figure is printed in black, the figure after "/" in red; single figures after the black entries run out are red.)

The entries in this table show the number of observations needed in t-test of the significance of a mean (black) and of a difference between two means (red) in order to control the probabilities of the errors of the first and second kind at α and β respectively. α is the chance of being wrong when you say the difference is significant, and β is the chance of being wrong when you say the difference is not significant.

Source: O. L. Davies, "Design and Analysis of Industrial Experiments" Table E-1, Oliver & Boyd Ltd, Edinburgh.